TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER
19378.0011

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)
09/857606

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/SE99/02300	8 December 1999	11 December 1998

TITLE OF INVENTION
ZIRCONIUM BASED ALLOY AND COMPONENT IN A NUCLEAR ENERGY PLANT

APPLICANT(S) FOR DO/EO/US
Mats Dahlbäck, Magnus Limbäck, Gunnar Wikmark

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [x] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. § 371.
3. [x] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. [x] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. [x] A copy of the International Application as **published** (35 U.S.C. 371(c)(2))**WO 00/36170**
   a. [x] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).

7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.

8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3).

9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).

10. ☐ A translation of the Annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. Below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.

12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.

13. [x] A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.

14. ☐ A substitute specification.

15. ☐ A change of power of attorney and/or address letter

16. [x] Other items or information:

PCT/ISA/210
PCT/IPEA/401
PCT/IPEA/409
PCT/RO/101

JC18 Rec'd PCT/PTO 0 8 JUN 20

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/85[illegible]606	PCT/SE99/02300	19378.0011

	CALCULATIONS	PTO USE ONLY
X The following fees are submitted: **Basic National Fee (37 CFR 1.492(a)(1)-(5)):** Search Report has been prepared by the EPO or JPO......**$860.00** International preliminary examination fee paid to USPTO (37 CFR 1.482)......**$690.00** No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))......**$760.00** Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO......**$1,000.00** International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)......**$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	**$1,000.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 [x] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 130.00	

Claims	Number Filed	Number	Rate		
Total Claims	12 - 20 =	0	X $18.00	$	
Independent Claims	1 - 3 =	0	X $80.00	$	
Multiple dependent claim(s)(if applicable)			+ $270.00	$	

TOTAL OF ABOVE CALCULATIONS =	**$1,130.00**	
Reduction by 1/2 for filing by small entity, if applicable.	$	
SUBTOTAL =	**$1,130.00**	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$	
TOTAL NATIONAL FEE =	**$1,130.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +	$	
TOTAL FEES ENCLOSED =	**$1,130.00**	
	Amount to be: Refunded	$
	Charged	**$1,130.00**

a. ☐ A check in the amount of $___ to cover the above fees is enclosed.

b. [x] Please charge my Deposit Account No. 19-5127; 19378.0011 in the amount of **$1,130.00** to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [x] The Director is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-5127. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b) must be filed and granted to restore the application to pending status

SEND ALL CORRESPONDENCE TO:
Edward A. Pennington
Swidler Berlin Shereff Friedman, LLP
3000 K Street, N.W., Suite 300
Washington, DC 20007-5116

Eric Franklin
SIGNATURE

Eric J. Franklin
NAME

37,134
REGISTRATION NUMBER

Atty Docket: 19387.0011

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:		:		
Mats Dahlbäck et al.		:		
Serial No.:	To be assigned U.S. National Phase of PCT/SE99/02300	:	Art Unit:	To be assigned
Filed: Herewith		:	Examiner:	To be assigned

For: Zirconium Based Alloy and Component in a Nuclear Energy Plant

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Prior to examination, please amend the above-identified application as follows:

In the Claims:

Please amend the claims as follows:

Clean copy of amended claims

3. A zirconium-based alloy according to claim 1, charaterised in that it comprises up to 0.2 percentage by weight Ni.

4. A zirconium-based alloy according to claim 1, characterised in that it comprises up to 0.6 percentage by weight Cr.

5. A zirconium-based alloy according to claim 1, characterised in that the total content of Nb and Sn is larger than or equal to 1.15 percentage by weight.

6. A zirconium-based alloy according to claim 1, characterised in that the alloy constitutes at least a part of a component in a nuclear energy plant.

8. A component in a nuclear energy plant, characterised in that it comprises an alloy according to claim 1.

10. A component according to claim 8, characterised in that it defines a cladding tube for nuclear fuel.

Amended claims

3. (Amended) A zirconium-based alloy according to claim 1 [or 2], charaterised in that it comprises up to 0.2 percentage by weight Ni.

4. (Amended) A zirconium-based alloy according to [any one of the claims 1-3] claim 1, characterised in that it comprises up to 0.6 percentage by weight Cr.

5. (Amended) A zirconium-based alloy according to [any one of the claims 1-4] claim 1, characterised in that the total content of Nb and Sn is larger than or equal to 1.15 percentage by weight.

6. (Amended) A zirconium-based alloy according to [any one of the claims 1-5] claim 1, characterised in that the alloy constitutes at least a part of a component in a nuclear energy plant.

8. (Amended) A component in a nuclear energy plant, characterised in that it comprises an alloy according to [any one of the claims 1-5] claim 1.

10. (Amended) A component according to claim 8 [or 9], characterised in that it defines a cladding tube for nuclear fuel.

Remarks

Applicants have amended the claims to eliminate multiple dependencies.

Respectfully submitted,

Date: June 7, 2001

Eric J. Franklin, Reg. No. 37,134
Swidler Berlin Shereff Friedman
3000 K Street, NW, Suite 300
Washington, DC 20007
Telephone: (202) 424-7605

Zirconium-based alloy and component in a nuclear energy plant

BACKGROUND OF THE INVENTION AND PRIOR ART

The present invention concerns a zirconium-based alloy, suitable for use in a corrosive environment where it is subjected to increased radiation and comprising 0.5-1.6 percentage by weight Nb and 0.3-0.6 percentage by weight Fe. The invention also concerns a component in a nuclear energy plant, which comprises an alloy of the mentioned kind.

According to the prior art it is known to provide, in a nuclear energy plant, a component which comprises a zirconium-based alloy of the above-mentioned kind. Such an alloy has the advantage of fulfilling the requirements which are demanded on mechanical as well as corrosion properties of a material which in a corrosive environment is subjected to an increased radiation, in particular neutron radiation of the fast neutron kind.

Thanks to its relatively high Fe-content it is possible through a suitable heat treatment, comprising annealing and quenching, to obtain secondary phase particles consisting of Zr, Fe and Nb in a matrix of α-phase of the zirconium-based alloy. By a suitable choice of the heat treatment variables time and temperature it is furthermore, with given contents of the included alloying materials Nb and Fe, possible to control the size of and the distribution of the secondary phase particles. The secondary phase particles may have a positive effect on the corrosion resistance of the alloy. It is therefore important to optimize the distribution of and

the size of the existing secondary phase particles. It is thereby highly important to find a suitable composition of the alloying elements included in the alloy.

The document US 5 560 790 describes a zirconium-based alloy which comprises 0.5-1.5 percentage by weight Nb, 0.9-1.5 percentage by weight Sn and 0.3-0.6 percentage by weight Fe. Furthermore, this alloy comprises 0.005-0.2 percentage by weight Cr, 0.005-0.04 percentage by weight C, 0.05-0.15 percentage by weight O, 0.005-0.15 percentage by weight Si and the rest Zr. Thereby a microstructure is achieved in the material which includes particles of the kind $Zr(Nb,Fe)_2$, $Zr(Nb,Cr,Fe)$ and $(Zr,Nb)_3Fe$. These secondary phase particles give the material good corrosion properties and good mechanical properties. Thanks to the high Fe-content, precipations of β-Nb-phase are avoided, which would have a negative influence on the resistance of the material against local corrosion attacks.

Sn is said to have a high solubility in the α-phase and will therefore, when it is present to the given amount, be dissolved in the α-phase and contribute to improved corrosion properties and mechanical properties of the same. It is pointed out that a too low content of Sn (below 0.9 percentage by weight) in the material influences the tensile strength of the material both in the long and in the short term. Furthermore, such a low Sn-content suppresses to a smaller extent a negative effect of a possible nitrogen incorporation on the corrosion resistance of the material. A Sn content above 1.5 percentage by weight influences the susceptibility of the material to working and in particular to cold working.

It is mentioned that Si and C contribute to a reduction of the size of the particles and to bring about a structural homogeneity in the material.

Oxygen is said to contribute to a finer structure of the material and is also used as a means for reinforcing the material through the solid solution, a so-called "solid solution strengthener".

Nb is said to contribute to the strength properties of Zr and increases the corrosion resistance of the alloy by forming secondary phase particles together with Zr and Fe.

It is furthermore pointed out that with a Nb-content below 0.5 percentage by weight of the material, a Fe-content below 0.3 percentage by weight and a Cr-content below 0.005 percentage by weight, the total portion of secondary phase particles of the above-mentioned kind in the α-zirconium matrix of the end product is considerably lower than 60 percentage by volume of the total amount of iron-containing secondary phase particles, which results in that the corrosion resistance of the material is negatively influenced. With a Nb-content above 1.5 percentage by weight, a large number of large particles of β-Nb phase are formed in the material, which also reduces the corrosion resistance of the same.

It is also mentioned that a Cr-content above 0.2 percentage by weight may result in the formation of binary intermetallic compounds of Zr-Cr, which has an opposite i.e. negative, influence on the workability and the tensile strength of the material.

SUMMARY OF THE INVENTION

A purpose with the present invention is to provide a zirconium-based alloy with such a composition that the distribution of and the size of secondary phase particles in the alloy, the kind of secondary phase particles and the

content of different alloying elements in the α-phase of the alloy are such that the alloy is optimized with respect to physical and mechanical properties as well as corrosion properties. In particular, these properties should be optimized with respect to an application where the alloy is subjected to an increased radiation of the fast-neutron kind in a corrosive environment, such as in the reactor core of a nuclear energy plant. In particular it is aimed at improved corrosion properties of the alloy with respect to the corrosion properties of the above-mentioned alloys according to the prior art.

This purpose is achieved by means of an alloy of the kind initially defined, which alloy is characterised in that it comprises 0.5-0.85 percentage by weight Sn. This choice of Sn-content stands in opposition to that which, according to the prior art, is a preferred interval for the Sn-content. The applicant has however found that improved corrosion properties, in particular in the environment which is the case in the area of the reactor core of a nuclear energy plant, may be achieved in the zirconium-based alloy by a careful choice of the Sn-content within the defined interval.

According to a preferred embodiment of the alloy, the content of Sn in the alloy is larger than or equal to 0.65 percentage by weight. A preferred interval for the Sn-content should thus be 0.65-0.85 percentage by weight with the purpose of achieving as good corrosion properties in the alloy as possible under the otherwise given conditions.

According to a further preferred embodiment, the alloy comprises up to 0.2 percentage by weight Ni. Thereby secondary phase particles containing Zr, Ni and Fe may be obtained in the alloy. Such secondary phase particles

contribute to improved corrosion properties of the alloy and have good stability under neutron radiation.

According to a further preferred embodiment, the alloy comprises up to 0.6 percentage by weight Cr, which is more than the maximum 0.2 percentage by weight which has previously been recommended with respect to the formation of binary intermetallic compounds of Cr and Zr. With the remaining composition which the alloy according to the invention has, a content of up to 0.6 percentage by weight Cr may however be permitted in order to improve the corrosion properties of the alloy, without the alloy thereby obtaining considerably worse mechanical properties, such as a deteriorated tensile strength. Unlike the prior art, the present invention thus suggests a zirconium-based alloy with a Cr-content above 0.2 percentage by weight, up to 0.6 percentage by weight.

According to a further preferred embodiment, the total content of Nb and Sn is larger than or equal to 1.15 percentage by weight. Such a total content of Nb and Sn contributes to improved mechanical properties of the alloy.

Which requirements on mechanical properties and corrosion properties that finally are demanded on the alloy depend on in which application the alloy finally is to be used. According to a preferred embodiment of the invention, the alloy constitutes at least a part of a component in a nuclear energy plant. The component is preferably arranged in the area of the reactor core and constitutes, according to a further preferred embodiment, a part of a fuel assembly. In such an application high requirements will at least be demanded on the corrosion properties of the alloy. Depending on to which extent the component has a supporting function, specific requirements will also be demanded on the mechanical properties of the alloy. An alloy of the kind

which is suggested by the invention is in particular suitable to constitute at least a part of a cladding tube, a spacer or a box.

A further purpose of the invention is to provide a component in a nuclear energy plant, which component in particular has satisfactory corrosion properties with respect to the specific conditions which may be assumed to be the case in the nuclear energy plant, in particular in the area of the core of the same, where the component is subjected to an increased radiation of the fast neutron kind, in a corrosive environment, e.g. surrounded by a corrosive medium, such as water.

This purpose is achieved by means of a component of the initially defined kind, which comprises an alloy according to the invention.

According to a preferred embodiment, the component constitutes a part of a fuel assembly, i.e. it is arranged in the area of the reactor core. Thereby specific requirements are demanded on its corrosion properties in the environment of increased radiation and corrosive media which it is subjected to. The choice of a zirconium-base alloy with a suitable composition is consequently highly important.

According to a further preferred embodiment, the component defines a cladding tube. Thereby also specific mechanical properties of the component are required, which are fulfilled by the alloy according to the invention.

According to a further preferred embodiment, at least a part of the inner circumference of the cladding tube comprises a layer of a material which is more ductile than the alloy according to the invention. The cladding tube is thereby

made less sensitive to the direct contact with the fuel within these. The risk for crack formation of the cladding tube in areas where it comes into direct contact with and possibly is subjected to wear caused by the fuel is reduced, under the condition that the layer of the more ductile material is arranged in these areas, which preferably is the case. Said layer comprises here a zirconium-based alloy with a total content of alloying materials which does not exceed 0.5 percentage by weight.

Further advantages with and features of the alloy according to the invention and the component, respectively, will be clear from the following, detailed description.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

A component arranged in a nuclear energy plant, more precisely in the area of the reactor core, is subjected to increased radiation of the fast neutron kind in a corrosive environment. The reactor may be a pressure water or a boiling water reactor. The component constitutes a part of the fuel assembly. In this example the component is a cladding tube arranged to contain the reactor fuel.

The component comprises a zirconium-based alloy which has the following composition:

0.5-0.85 percentage by weight Sn,
0.3-0.6 percentage by weight Fe,
0-0.6 percentage by weight Cr,
0-0.2 percentage by weight Ni,
0.65-1.6 percentage by weight Nb and the rest zirconium.

The content of Ni is preferably within the interval 0.05-0.2 percentage by weight.

According to an alternative embodiment the alloy comprises
0.65-0.85 percentage by weight Sn and
0.5-1.6 percentage by weight Nb,
with the remaining elements within the previously mentioned intervals.

The cladding tube may be formed from a solid bar, in the centre of which a hole has been drilled. Furthermore, the component has, in addition to prior annealings in connection with the working of the same, finally been annealed in the β-phase area of the alloy and then been quenched by a β-quenching in the α-phase area of the alloy.

By the annealing in the β-phase area, course structures and other effects of the prior heat treatment history are removed from the alloy. Furthermore, the orientated texture which has been obtained during prior working of the work piece of the tube is removed, whereby different tendencies to growth in different directions of the component, when it is exposed to neutron radiation in the core, are avoided.

The cooling to the α-phase area is so fast that an entity of short α-phase laminae is formed in the prior β-phase grains. Short α-laminae improve the mechanical strength of the alloy.

Furthermore at the quenching from the β-phase area to the α-phase area secondary phase particles of intermetallic compounds, such as $Zr(Nb,Fe)_2$, $Zr(Fe,Cr,Nb)$ and $(Zr,Nb)_3Fe$, are precipitated, which favours good anticorrosive and mechanical properties of the finished alloy and thereby of the component. The quenching speed should thereby be adjusted such that an optimal secondary phase particle distribution and secondary phase average particle size are obtained. The alloy is preferably cooled with a cooling

speed below 100°C/second, preferably below 50°C/second and most preferred in order of magnitude 5-20°C/second.

When the component, such as here, is a cladding tube, preferably a layer with a lower total content of alloying elements than the remaining alloy is applied on the inner circumference of the cladding tube. The total content of alloying materials in this layer is preferably below 0.5 percentage by weight, wherein the remaining part constitutes Zr. This layer makes the cladding tube more resistant to mechanical influence from the reactor fuel which is arranged in the tube and which physically may rest against and cause tensions in the walls of the cladding tube.

Preferably the alloy according to the invention comprises no essential amount of other materials than those which have been mentioned above. It should however be noted that small amounts of impurities may exist in the alloy. Typical impurities which may exist in zirconium-based alloys are specified in the table below. Furthermore, small amounts of Si and O may exist in the alloy. Typical contents of these materials are also given below:

Table:

Element	Al	B	C	Ca	Cd	Cl	Co
Max.ppm	75	0.5	270	30	0.5	20	20

Element	Cu	H	Hf	Mg	Mn	Mo	N
Max.ppm	50	25	100	20	50	50	80

Element	Na	Pb	Si	Ti	U
Max.ppm	20	130	120	50	3.5

Si and O may exist in contents where Si is 50-120 ppm and O is 500-1600 ppm.

It should be realised that a number of alternative embodiments of the alloy and the component according to the invention will be obvious to a person skilled in the art but still be within the scope of the invention, such as it is defined in the annexed claims.

Claims

1. A zirconium-based alloy, suitable for use in a corrosive environment, where it is subjected to increased radiation, wherein the alloy, in addition to zirconium and for zirconium of a reactor quality normal contents of impurities, comprises 0.5-1.6 percentage by weight Nb and 0.3-0.6 percentage by weight Fe, characterised in that it comprises 0.5-0.85 percentage by weight Sn.

2. A zirconium-based alloy according to claim 1, characterised in that the content of Sn in the alloy is larger than or equal to 0.65 percentage by weight.

3. A zirconium-based alloy according to claim 1 or 2, characterised in that it comprises up to 0.2 percentage by weight Ni.

4. A zirconium-based alloy according to any one of the claims 1-3, characterised in that it comprises up to 0.6 percentage by weight Cr.

5. A zirconium-based alloy according to any one of the claims 1-4, characterised in that the total content of Nb and Sn is larger than or equal to 1.15 percentage by weight.

6. A zirconium-based alloy according to any one of the claims 1-5, characterised in that the alloy constitutes at least a part of a component in a nuclear energy plant.

7. A zirconium-based alloy according to claim 6, characterised in that said component constitutes a part of a fuel assembly.

8. A component in a nuclear energy plant, characterised in that it comprises an alloy according to any one of the claims 1-5.

9. A component according to claim 8, characterised in that it constitutes a part of a fuel assembly.

10. A component according to claim 8 or 9, characterised in that it defines a cladding tube for nuclear fuel.

11. A component according to claim 10, characterised in that at least a part of the inner circumference of the component comprises a layer of a material which is more ductile than said alloy.

12. A component according to claim 11, characterised in that said layer comprises a zirconium-based alloy with a total content of alloying elements which does not exceed 0.5 percentage by weight.

55276 US

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (includes Reference to PCT International Applications)	Attorney's docket No.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ZIRCONIUM BASED ALLOY AND COMPONENT IN A NUCLEAR ENERGY PLANT

the specification of which (check only one item below):

[ ] is attached hereto.

[ ] was filed as United States application.
Serial No. _____
on _____
and was amended
on _____ (if applicable).

[X] was filed as PCT international application
Number PCT/SE99/02300
on 08/12/99
and was amended under PCT Article 19
on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY (if PCT indicate PCT)	APPLICATION NO.	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119
Sweden	9804292-2	11/12/98	[x] YES [ ] NO
			[ ] YES [ ] NO
			[ ] YES [ ] NO

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

55276 US

Combined declaration for patent application and power of attorney (continued) (includes Reference to PCT International Applications)	Attorney's docket No.

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

U.S. APPLICATIONS		STATUS (Check one)		
APPLICATION NO.	U.S. FILING DATE	PATENTED	PENDING	ABANDONED

PCT APPLICATIONS DESIGNATING THE U.S.					
APPLICATION NO.	FILING DATE	US SERIAL NO. ASSIGNED (if any)			
PCT/SE99/02300	8/12/99				

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration number): **Edward A. Pennington (Reg. No. 32,588); John P. Moran (Reg. No. 30,906); Eric J. Franklin (Reg, No. 37,134); Michael A Schwartz (Reg. No. 40,161); Robert C. Bertin (Reg. No. 41,488); Alicia A. Meros (Reg. No. 44,937); Chadwick A. Jackson (Reg. No. 46,495), Edward J. Naidich (Reg. No. 43,826) and Sean O'Hanlon (Reg. No. 47,252)**

Send correspondence to: SWIDLER BERLIN SHEREFF FRIEDMAN, LLP 3000 K Street, Suite 300, Washington, D.C. 20007, USA	Telephone : (202) 424-7500

FULL NAME OF INVENTOR (201)	FAMILY NAME Dahlbäck	FIRST GIVEN NAME Mats	SECOND GIVEN NAME
RESIDENCE & CITIZENSHIP	CITY Västerås	STATE OR FOREIGN COUNTRY Sweden SEX	COUNTRY OF CITIZENSHIP Sweden
POST OFFICE ADDRESS	POST OFFICE ADDRESS Mangelgatan 13	CITY Västerås	STATE & ZIP CODE/COUNTRY SWEDEN-724 76
FULL NAME OF INVENTOR (202)	FAMILY NAME Limbäck	FIRST GIVEN NAME Magnus	SECOND GIVEN NAME
RESIDENCE & CITIZENSHIP	CITY Västerås	STATE OR FOREIGN COUNTRY Sweden SEX	COUNTRY OF CITIZENSHIP Sweden
POST OFFICE ADDRESS	POST OFFICE ADDRESS Släggargatan 16	CITY Västerås	STATE & ZIP CODE/COUNTRY SWEDEN-723 37
FULL NAME OF INVENTOR (203)	FAMILY NAME Wikmark	FIRST GIVEN NAME Gunnar	SECOND GIVEN NAME
RESIDENCE & CITIZENSHIP	CITY Uppsala	STATE OR FOREIGN COUNTRY Sweden SEX	COUNTRY OF CITIZENSHIP Sweden
POST OFFICE ADDRESS	POST OFFICE ADDRESS Oslogatan 49	CITY Uppsala	STATE & ZIP CODE/COUNTRY SWEDEN-752 34

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true: and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201	SIGNATURE OF INVENTOR 202	SIGNATURE OF INVENTOR 203
DATE 2001-06-06	DATE 2001-06-11	DATE 2001-06-18